AMERICAN CHEMICAL SERVICES
RI PHASE II INVESTIGATION PROPOSALS

I. Introduction

The purpose of these proposals will be to set the stage for deciding which exercises are appropriate and necessary to help complete the RI at the ACS site, and which will provide substantial data upon which to base the FS and the ROD. Among the topics to be discussed will be: site geological characterization; chemical and physical characterization of the groundwater system; chemical and physical characterization of the vadose zone; treatability studies on contaminated soils, wastes and groundwater; wetlands assessment and delineation; chemical and physical characterization of surface water and sediments; and waste characterization. The proposals will be discussed according to their respective subjects and will include a listing of proposed investigations.

II. Phase I Investigations

During the Phase I investigation, the overall scope of the project focused on gathering enough information to assess the horizontal flow characteristics and the interconnection of groundwater and surface water in the upper aquifer; examine, and attempt to chemically characterize and delineate the extent of waste burial; determine the predominant contaminants of concern in the groundwater system; generally assess the site's impact upon surface water/sediment contamination; and determine the hydrogeological and contaminant characteristics of the City of Griffith Municipal Landfill.

III. Phase II Investigations

In Phase II of the RI activities for the site, the following activities should be incorporated and implemented:

- Continuation of water table and surface water benchmark measurements on a regular basis (i.e., monthly);
- Complete delineation of groundwater contaminant plume(s);
- Aquifer system testing and engineering classification;
- Further characterization of on-site stratigraphy;
- Complete delineation of surface water and sediment contamination;
- Delineation of the surrounding wetlands and an

assessment of any environmental damage and/or stresses to the wetland environment;

- Conducting treatability studies to evaluate the various technologies which may be applied to the wastes, contaminated soils, sediments, surface water and groundwater at the site; and

- Completing delineation of waste burial and assessment of the chemical characteristics of the wastes.

A point by point discussion of these various subjects mentioned are addressed below:

A. Groundwater and Surface Water Flow Direction

Due to the complex nature of the interactions between surface water and shallow groundwater flow at the site, it is prudent that monthly groundwater and surface water level measurements be taken throughout the length of the RI. During the Phase I activities, two sets of groundwater levels were taken, it is advisable that a stepped-up program which obtains regular shallow aquifer and surface water elevations is crucial to achieving a thorough understanding of the site's hydrogeological conditions. This is especially true during the winter months, when it is expected that shallow aquifer pumping will be at a minimum, and it is also true in the early spring when recharge of the shallow aquifer will be at a maximum. Other evaluations to be considered include the placement of additional piezometers into the clay layer which lies between the upper (Calumet) aquifer and the lower (Valparaiso) aquifer and the placement of piezometers into the Valparaiso aquifer. These installations are necessary to gain an overall understanding of the vertical and horizontal flow characteristics which exist in these two geologic units and which will direct any future evaluations that may be necessary of the Valparaiso aquifer. Piezometers placed into these units will undergo the same monthly elevation determination proposed for the Calumet piezometers.

B. Shallow Aquifer Plume Delineation

During the Phase I investigation, the purpose of the groundwater monitoring scheme was to gain an understanding of the chemistry of the contaminated portions of the aquifer and attempt to gain some indication of the direction of contaminant movement in the subsurface. During the second phase of the RI, the focus of the groundwater investigations will be to delineate the extent of contamination in the horizontal direction and begin exploration in the vertical direction by monitoring the Valparaiso aquifer. To optimize the quality of this delineation in terms of both time and resources, it is imperative that qualitative "screening" methods such as soil gas and "Hydropunch" technology be applied to select appropriate locations for the next set of monitor wells at the site. These qualitative investigative methods will maintain the level of data quality that is attainable by field GC measurement. The level of data confidence will correspond to an appropriate level of confidence as they are outlined in the latest RI/FS guidance document. A standard SOP for a field GC is available from U.S. EPA. A proper QA/QC program will be utilized to ensure proper data collection and will be addended to the existing QAPP along with any additional Phase II procedures. Following the qualitative exercises, shallow zone monitoring wells will be placed in areas near the suspected edge of the contaminant plume and within known contaminated areas to fully define the chemical nature of the leading front of the plume and the interior of the plume. Following placement of the horizontal delineation wells, additional wells will be placed into the clay unit between the upper "Calumet" aquifer and the lower "Valparaiso" aquifer, to characterize the clay unit's chemistry and its horizontal and vertical flow characteristics. According to the work plan, an additional three Valparaiso aquifer wells will be installed to determine the flow and chemical characteristics of that aquifer. These wells are expected to be placed in a downgradient direction in close proximity to the greatest known Calumet aquifer contaminant source area. It was noticed upon a review of the groundwater data that various unknown parameters exist at relatively higher concentrations in some of the wells. An attempt will be made to determine the identity of the various "unknown" organic compounds which were found in the samples taken in Phase I.

C. <u>Aquifer Tests and Engineering Evaluation</u>

To properly understand the engineering properties of the aquifer system and to determine the hydraulic interactions between the Calumet and Valparaiso aquifers, additional aquifer tests need to be performed at the site. Aquifer tests that are warranted at this site include pump testing to evaluate the hydraulic conductivity of the upper and lower aquifers, and to determine the degree of interaction that exists between the Calumet and Valparaiso aquifers. Pump testing will also yield field measurements showing the degree of drawdown experienced in the Calumet and Valparaiso aquifers. This information will allow for a more accurate fit of computer models to the natural conditions at the site. Pump tests in both aquifers should be completed during the expected seasonal low and high for the Calumet aquifer. Some pump tests should be performed at or near the Griffith landfill so that the effect of the landfill upon the local groundwater regime can be adequately measured.

Engineering evaluations of the aquifers should include measurements of the following engineering parameters: an evaluation of total aquifer porosity by use of insitu "wet" weight versus the dry weight analysis; gradational analysis of the aquifer materials; general mineralogy of the aquifer materials; organic carbon content; and the sorptive properties of the aquifer materials. Engineering evaluations specific to the clay layer, should include its diffusive properties and a determination of the layer's fracture patterns. These determinations are designed to aid in the examination of the integrity of the clay layer to resist invasion by non-aqueous phase liquid organics.

D. Further Characterization of Site Stratigraphy

Additional evaluation should be completed concerning the site's subsurface stratigraphy. Special attention should be placed upon the surface configuration and continuity of the clay layer which lies between the Calumet and Valparaiso aquifers. The determination of the clay layer surface configuration will be used to track the progression of any non-aqueous phase liquid organics which are very likely to exist in the site's subsurface. The thickness of the clay unit should also be determined throughout the site's subsurface. These determinations are believed necessary, due to reports by local well owners that the clay layer was either very thin or nonexistent under their property. Also, by determining the surface configuration of the clay layer, an average thickness of the Calumet aquifer can be determined which will aid in the estimation of its pore volume. The measurement of pore volume is crucial to estimating the time and relative cost associated with the option of pumping and treating the groundwater in the Calumet aquifer. Seismic geophysics may be the most appropriate method available, to determine on a grand scale, the interfaces between the

Calumet, the clay unit, and the Valparaiso aquifers. Other geophysical methods may also prove fruitful. Any geophysical methods used, should be followed by the installation of the Valparaiso aquifer monitoring wells and piezometers, the installation of clay layer piezometers and monitoring wells, and by any additional borings that may be necessary to fill known data gaps. By following the geophysics with the required piezometer and monitoring well installation program, the accuracy of the geophysical method(s) can be established and a level of confidence applied to geophysical measurements taken in portions of the site where little or no physical data is available.

E. Delineation of Surface Water/Sediment Contamination

A pattern of surface water and sediment sampling is to be established within the confines of the current wetland areas and their associated drainageways. Preliminary data from scattered locations in the wetland areas and surface water drainage paths, has revealed that low levels of PCBs, phenols and other hazardous substances exist in the wetland sediments. Further chemical delineation of the wetlands is necessary since the majority of samples taken in the first phase of the investigation concentrated sampling efforts on what is believed to be the outer fringes of known wastewater discharge and disposal in the wetland areas west of the ACS property line. Other sampling efforts concentrated on obtaining samples from surface water points around the site. This achieved the desired results, which were to gain an indication of the degree of contamination in surface water and sediments from various locations around the site. The next appropriate step in this process will be to assess the extent of the contamination in the affected surface water features at the site. This investigation will include a more concentrated sampling effort near areas where contamination was found in either the surface water or the sediments associated with these areas. An example of such an area would be the surface water feature situated between the Off-site Containment Area and the City of Griffith Landfill. In addition to samples taken for delineation of contamination in the sediments, samples are to be taken to determine the organic carbon content and the gradational analysis of the sediments in the wetland areas. These tests are necessary to determine the sorptive capabilities of the wetland soils and to determine the degree to which the sediments in the wetland can absorb priority pollutants.

F. Wetlands Delineation and Damage Assessments

An important first step in assessing the wetlands surrounding the ACS site will be to complete a wetland delineation and perform a functional assessment of the various wetland habitats. The resulting wetlands delineation map will form a necessary first step in assessing the quality of the wetlands which will be used to justify appropriate actions in the FS and the ROD. Following an evaluation of the organic and heavy metal concentrations in the wetland areas, various tests such as residue analysis, physiology/productivity evaluations, toxicity testing and other studies may be appropriate. Species lists and populations must also be compiled for the wetland areas and their associated habitats. Both resident and transient species are to be counted during these exercises. The lists and associated evaluations are necessary to assess the risks and damage that contamination at the site has caused or may potentially cause to the habitats associated with the wetlands, and the eventual effect upon the environmental food chain. These assessments of the wetland areas are a common engineering practice and are routinely carried out for almost all construction activities that may potentially impact a nearby wetland.

G. Treatability Studies

Although contingent upon the results of inorganic analyses of the site's groundwater and site surface soils, biological treatment of the groundwater and surface soils may be a viable option. A preliminary assessment of the surfacial soils and the Calumet aquifer materials, reveal that the Calumet may be a prime candidate for bioremediation. Some of the more heavily contaminated surface soils at the site are probable to have been contaminated with metals thus rendering them difficult to bioremediate (this mainly includes surface soils associated with the on-site containment areas and the Kapica Drum property surface contamination). Treatability studies at this stage of the investigation are not as crucial as the measurement of necessary biophysical and biochemical parameters such as: the sorptive capabilities of the aquifer, the average yearly temperature of the aquifer, the average yearly depth to the groundwater table, the permeability of the aquifer materials and the production rate of the aquifer, the natural levels of organic and inorganic biochemical support parameters such as the concentration of phosphorous, nitrogen compounds, sulfur compounds, Redox, dissolved oxygen, pH, and TOC. The vadose zone should also be examined for its potential to be bioremediated. The most likely candidate in the vadose zone soils to be bioremediated include the "natural looking" soils which underlie the heavily stained and oily soils on the Kapica property and other less affected but nevertheless contaminated soils. This is mainly due to the belief that these soils have not been seriously impacted by excessive concentrations of heavy metals which would greatly impair bioremediation of these soils. Other studies should include an assessment of the populations of unicellular organisms which exist in the contaminated subsurface. These studies shall be conducted by the collection of soil cores in both the vadose and saturated zones and by conducting a count of the organisms.

Treatability studies to be conducted at the site may include pilot studies on contaminated portions of the wetland areas to determine the viability of insitu bioremediation of the wetland sediments. These pilot studies will determine whether insitu treatment of the sediments in the wetlands are possible. Other treatability studies may include the viability of the heavily contaminated materials and wastes for possible incineration. Pretreatment methods should also be evaluated. Due to the natural inclination of organic substances to attach themselves to polar soil particles such as clays and silts, other important evaluations should concentrate on evaluating various segregation techniques designed to minimize the volume of soils needing incineration and treatment. Some common soils/waste segregation techniques may include screening, sedimentation, clarification or soil washing. It is apparent given the concentrations of the waste material found buried at the site and the possibility that these wastes are contaminated with largely nonbioremedial wastes such as metals and large insoluble organics (such as PCBs), that the most cost-effective, permanent and safe on-site remedy may be incineration. Treatability studies to be investigated for wastes at the site, should include an evaluation of the BTU rating of the wastes and heavily contaminated soils and an assessment of the amount of ash which will be generated from the various waste and contaminated soils.

H. Additional Waste Burial Delineation and Closing of Data Gaps

Additional data may be needed to fully delineate the vertical and horizontal extent of waste burial in the off-site containment area, the Kapica Drum area and the on-site containment area portions of the site. During the boring program that was initiated during the first phase activities, it was apparent that municipal wastes were intermingled with the ACS generated wastes at the site. It is unclear, whether or not a clear line of demarcation between ACS generated wastes in the Off-site Containment Area and the City of Griffith landfill wastes has been effectively drawn. If they have been effectively drawn and a clear area can be delineated, then volume calculations may proceed. Other points to consider involve the actual characterization of the waste materials, according to the chemical content and distribution of the wastes. A report of more or less "homogeneous" waste materials in an area (if this can be demonstrated) will allow a fair assessment of waste types and volumes. If waste characterization data from the same general area cannot be adequately correlated with data from other samples in the same area (i.e., the off-site containment area waste samples show entirely different waste constituents in different areas of the landfill), then additional waste samples will be required to fully characterize waste types and volumes. This characterization is an important mechanism to address issues in the FS portion of the study. If large volumes of waste materials which require alternative treatment are not found during the RI, then the integrity of the FS and any future remedial actions may be significantly jeopardized.